Vol. VIII. MARCH 1924. No. 3.

THE MADRAS
Forest College Magazine.

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EDITED AT COIMBATORE.

MADRAS PRESIDENCY.

* * *

Published by the Principal,
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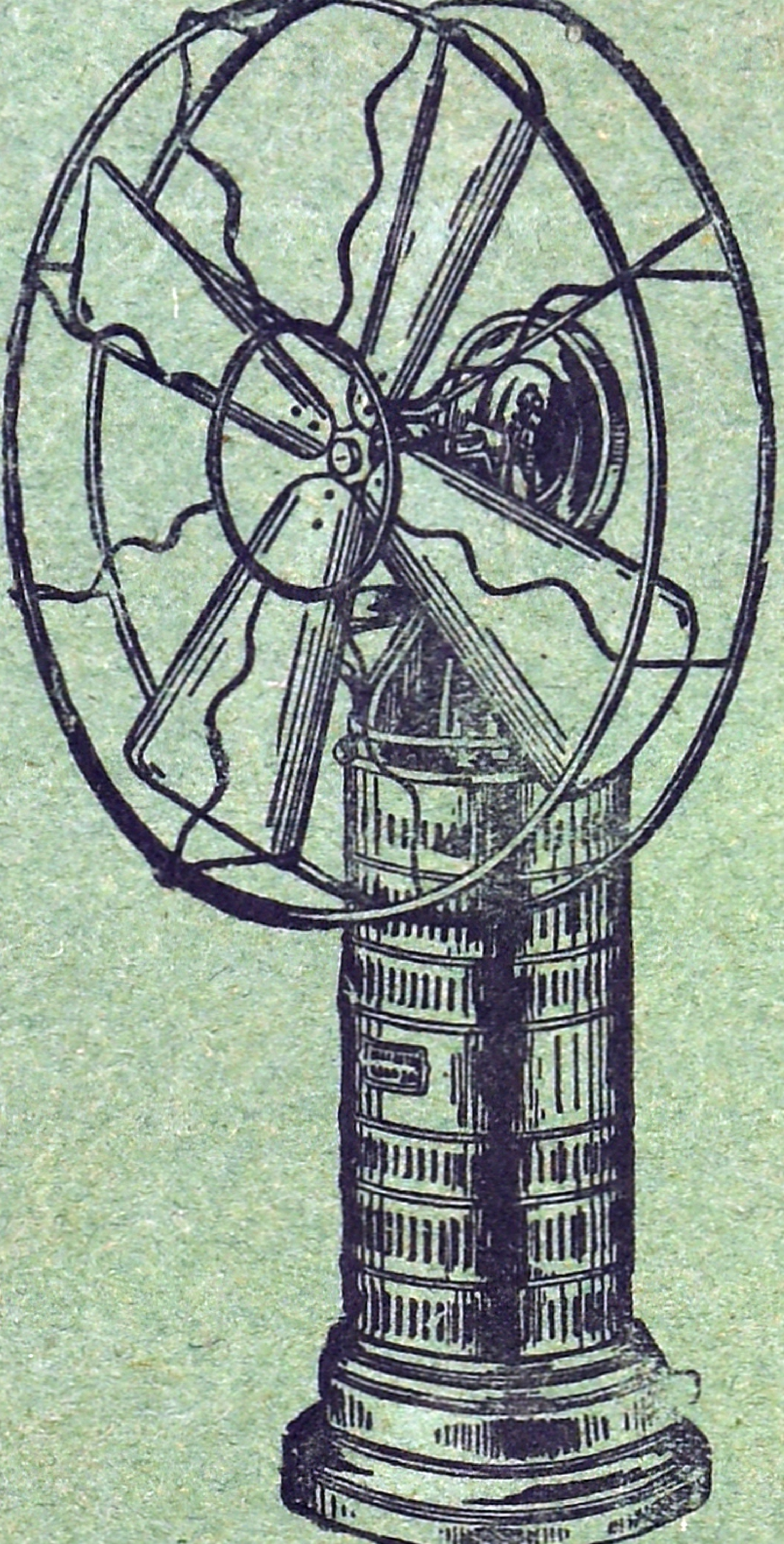

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THE

Madras Forest College Magazine.

Vol. VIII. MARCH 1924. No. 3.

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IMPORTANT NOTICE.

It is brought to the notice of subscribers that in spite of repeated requests, no outside contributions are being received for the Magazine. It is therefore announced that unless a sufficient number of contributions are received in the meantime, the number of issues of the Magazine will be reduced from four to two annually, as from June this year.

As an incentive to contributions, it has been decided to offer an annual prize of Rs. 15 for the best original article printed in the Magazine in the course of the year, the award to be decided by subscribers' vote. The first prize will be given after the publication of this year's June number, for what is considered to be the best article published in the September 1923, December 1923, March 1924 and June 1924 numbers. The prize will only be open to contributors of the Ranger class, and articles which have already won a prize will not be eligible. After reading the June number, subscribers are requested to send in their vote, and the result will be published in the September 1924 number. Further and more definite instructions will be given in the June number.

* * * * *

It is published for information that the Chief Conservator's prize of Rs. 30 for the best essay on village forests, has been awarded to M. R. Ry. A. Siddhan Pillai, Range Officer, Kanigiri range, Nellore District. It is hoped that we shall be able to publish the essay in our next issue.

Editor.

Indian Forester Prize 1924.

(for PRESENT Students.)

The subject for the above Prize for the current year will be:—

"The Regulation of Grazing in Forests."

The Prize is open to all **PRESENT** students of the College.

No award for either prize will be made unless a satisfactory standard is reached.

The Essays should be clearly written or typed on one side of the paper only and must reach the Principal not later than the 10th, nor earlier than the 1st, May 1924. Any Essay received after this date will not be considered.

Essays should not exceed 2000 words; in previous years students have been disqualified for infringing this rule.

Each Essay must bear a *Nom de plume*, which must also be written on the outside of a sealed envelope inside which is a paper containing the name of the competitor. The name of the competitor must not appear on the outside of the envelope or on the Essay. Each Essay must be the unaided work of the competitor submitting it.

W. G. DYSON,
Principal,
Madras Forest College.

II

Indian Forester Prize 1924.

(for **PAST** Students.)

A Prize alloted from the 'Indian Forester' Fund will be awarded to the **PAST** student of the Madras Forest College who submits the best Essay, on the following subject:

"Fuel coupes in Mixed Deciduous Forest—their Sylvicultural treatment and tending with special reference to financial results.

No award will be made unless a satisfactory standard is reached.

Essays should be clearly written or typed on one side of the paper only, and should not exceed 2000 words; they must reach the Principal not later than the 10th, nor earlier than the 1st May 1924.

Each Essay must bear a *Nom de plume*, which must also be written on the outside of a sealed envelope, inside which is a paper containing the name of the competitor. The name of the competitor must not appear on the outside of the envelope or on the Essay. Each Essay must be the unaided work of the competitor submitting it.

W. G. DYSON,
Principal,
Madras Forest College, COIMBATORE.

THE

Madras Forest College Magazine.

PUBLISHED QUARTERLY.

Vol. VIII. MARCH 1924. No. 3.

Course of Lectures on

Forestry,

Delivered at the Agricultural College, Coimbatore.

—By C. E. C. Fischer, Esq., I. F. S.—

—Published by kind permission of the author.

Lecture 4.

CAUSES OF DEFORESTATION. REMEDIAL MEASURES. FUNDAMENTAL PRINCIPLES OF FORESTRY.

We have already discussed the benefits derived from forests and their importance in the economy of the State, together with the evils that are brought about by their removal. It will be well now to enquire into the causes that operate towards their disappearance.

The chief cause, if not the only one, is man; whether directly, in clearing the land for his special purposes, or indirectly through his cattle or through fire. There has been no more fundamentally mischievous phrase than the words, "inexhaustible forests." *There is no such thing*. A forest may be considered inexhaustible only so long as not more produce is removed from it than is being added by natural growth. Where the forests are extensive and the population scanty and backward there is no danger of their exhaustion; there there is no need for rules and restrictions and man may freely enjoy the products of the forest.

By Man.

But with increase of population, by immigration as well as by natural multiplication, and as civilisation progresses, there is a gradual inversion. Not only are there more people to be provided for, but individual needs are greater and more complex. New land is required for extension of cultivation; the requirements in dwellings, in comforts, and in luxuries are redoubled. Commerce and industry spring up, and with them foreign trade and all the demands and trammels of modern civilisation arise. Besides the ordinary cultivation, plantations of coffee, tea, rubber etc., come into being, necessitating further extensive clearings of forest land. The vast change in the conditions is now evident. On the one hand there has been an enormous increase in the demand for forest produce, both in quantity and variety, and on

Clearings.

the other, the actual area of the forest that supplies these commodities has been very largely diminished. Clearly there must be a crucial point at which the expansion in demand and the shrinkage in supply bring the two on a level, so that a step further means that more is extracted from the forest than it can yield without deterioration.

Over exploitation.

Let us envisage the forest as a capital placed in a bank as a fixed deposit. Let us suppose the forest capital corresponds to a sum of 10, 000 rupees deposited, drawing interest at 5% per annum. The yearly income, therefore, is 500 Rupees. So long as the owner, whom we will presume has no other source of income whatever, spends no more than 500 rupees in the year he can continue indefinitely. But let us suppose that owing to marriage and increase in family, or rise in prices, or through any other cause, he finds himself unable to manage on that sum any longer and he is forced to spend 1,000 rupees a year. It requires no magician to show that he cannot go on long at that rate. Having spent 500 rupees he must withdraw by the end of the year another 500 from his deposit. That is to say he is encroaching on his capital. He starts the following year with only 9,500 rupees in the bank and the interest now only amounts to 475 rupees. But he still has to spend at least 1,000 rupees, so this year he must withdraw 525 rupees. His capital has shrunk now to 8,975 rupees. The capital diminishes by an increasing ratio year by year. Well! that is precisely what happens to the forest as soon as more is extracted than is being replaced. Unfortunately that is not all. Man is a careless and a selfish, as well as, too often, a profoundly ignorant being. Not content with extensive clearings, not satisfied with extracting more than the forest can yield, he is the cause of still further encroachment through his cattle and by fire. Just as there is a limit to the productivity of a forest in wood, so is there a limit in the number of cattle that can graze in it without serious harm being done. The process of deterioration is slow at first and not very obvious to the casual eye, and the number of cattle allowed to despoil the woods is unlimited by any fore-thought or reason. So long as the animals confine themselves to eating the grass the harm done is restricted to the trampling down of a proportion of the young plants on which the permanency of the forest depends. But when their numbers are so large that all the available grass is consumed before the new growth appears, the beasts must starve or turn their attention to the leaves within their reach. At this stage the injury to the forest begins to assume alarming proportions, a point which is reached very soon indeed. Then, in addition to killing part of the young growth by trampling, the cattle injure, retard the growth of, and kill a far larger number by browsing.

By overgrazing.

By cattle I have intended to indicate all domestic cattle except goats. The goat, owing to its habits, must ever be considered the arch enemy of the forest. It prefers leaves to grass it reaches up and actually climbs to shoots that other cattle do not attain and the damage it does far exceeds that of any other domestic animal.

By fires.

Man has discovered that the easiest, as it is the most wasteful, way of clearing the forest for his cultivation, is by burning it. Well and good so long as the fire is restricted to the area required. Unfortunately, in his gross ignorance and stupidity, in his criminal sloth, he takes no care to prevent the spread of fire to other parts of the forest. The flames, more or less fierce according to the nature of the growth and its dryness, burn up the humus and debris of the forest floor, so essential to its fertility, dissipate the nitrogen in the surface layers into the atmosphere and destroy or drive away the micro-organism and the earth worms., etc., that play so large a part in the perfecting of the soil. The fire also injures and kills out the young plants that are required to regenerate the forest, and, to a greater or lesser degree, damages the standing older growth, impairing its commercial value and utility.

Another factor in the serious diminution of the area of forest is the system of shifting cultivation indulged in by most primitive forest dwellers. An area is cleared and burnt to be cultivated for a couple of years. It is then abandoned in favour of a fresh area. It takes very many years before such a spot is restored to its original condition.

It is not only through neglect in burning his new clearings that man brings fire into the forest. Often and for various differing reasons he intentionally sets fire, it may be to secure an early re-growth of grass for his herds, to drive away wild animals, to clear forest paths, to facilitate hunting or the collection of minor produce. In short, fire may originate in a thousand and one ways, but you may be sure that in at least 99% of the cases it has occured through the agency of man, whether by intention or through negligence. Naturally occurring fires are exceedingly rare—at least in Southern India.

Man not only overexploits the forest through extraction of produce for genuine use, but he is wasteful of quality and quantity.

Man's waste.

Unchecked, he may use teak and rosewood, or other valuable timber, for fuel when any one of a number of other species, of little or no value for other purposes, would have done as well. One will require a pole to mend his hut. He sets out with his axe and selects a suitable tree, irrespective of its size, provided that it is not too small. He will shorten it if too long and leave the excess to lie and rot. It gives him no concern that he could have picked out an equally suitable smaller tree and have avoided waste. Further, it is quite likely that on his way he may spy another stem that he considers will suit his purpose better, he will not hesitate to throw away the first pole and cut the second.

Permit system.

This was the great evil at the root of the old objectionable permit system, now happily only a memory in most, if not all, of our districts. Under that system the purchaser of a permit at a nominal fee, gained the right, within wide limits, to go anywhere and select any tree. The system was a definite encouragement of every practice abhorred by sylviculture. It was natural for the permit holder to select the best species and the finest stems with the inevitable result that the best and soundest trees were removed, leaving the bad kinds, the unsound and the crooked. Look along the hills from your college and you will see precisely what I have indicated. In the most accessible places there is no vestige of good growth. The trees of any use have been felled, the scrub is hacked, the slopes overgrazed and the soil exposed and broken up by the trampling herds. You have to go far before any good trees can be found.

Denudation.

It is clear that man himself is responsible for the disappearance of forests. Nowhere have natural causes succeeded in denuding a region of tree growth without the agency of man. As Marsh writes: [1]"There is good reason to believe that the surface of the habitable earth, in all climates and regions which have been the abode of dense civilised populations was, with few exceptions, covered with a forest growth when it first became the home of man."

Once the integrity of the forest has been thus seriously impaired by extensive clearings, by voracious cattle, by fire and by excessive unregulated exploitation, the adverse causes we reviewed earlier come into play: erosion owing to heavy wash and deterioration of the soil by exposure. The ruin of the forest is now well on the way and will progress by leaps and bounds if preventive action is not taken in time.

1. "Man and Nature" p. 128.

Remedial Measures.

We have discussed the evil results of deforestation and enumerated the chief causes; we have seen that essentially man is the origin of all forest degradation. It follows that protective measures must aim at man. The most important step is education. Man must be taught to recognise that it is himself and his children that he is wronging and that his best interests lie in conserving and not destroying his forests. Beyond that the only recourse is to stringent laws. The forest laws of this country are exceedingly lenient, both intrinsically and in their application, as compared with those of most European lands, or even with other Penal Laws of India.

Temporary nature of engineering works as remedy.

For all the evils ensuing from the removal of forests the best remedy, the only permanent and radical cure, lies in the re-establishment of the woods. Reservoirs, dams, training works, retaining walls, all are temporary palliatives and not a permanent solution, unless accompanied by the regrowth of the forest. This is recognised in the alpine tracts of France, Switzerland, Italy and Austria. In those regions, where it is desired to fix an unstable slope that has become a danger to the habitations and cultivation below, the building of retaining walls is invariably accompanied by planting and sowing. The constructions are intended to keep the moving slope in check for the time being, and until this object can be far more effectively attained by the woods as they grow up. Denudation of this kind usually takes place along the course of ravines scoured out by torrential streams. The usual practice is to construct obstructions across the watercourse to stem the rush of water. Starting high up the slopes where the bed of the torrent is still narrow and the volume of water comparatively small, dams of earth, of wattle and mud or of logs are built up. Lower down, as the sectional area of the stream widens and the flow is more violent, the dams will be more solid and constructed of dry stone. Eventually near the valley bottom the largest constructions are of masonry and ashlar. At each dam the flow is checked and a small lake is formed. The sudden check causes much of the eroded wash to fall to the bottom, so that gradually a natural terrace is formed up behind each dam and the whole course of the torrent is thus stepped. Were the work restricted to this, in course of time the rush of water would reexcavate the terraces, undermine and sweep away the dams, and the situation would be as bad if not worse than before. But simultaneously with the construction of the dams the upper basin of the torrent is planted up. First the loose soil may be sown with the seeds of rapid - growing

Torrent-training

herbs and grasses which will bind the surface until the young plants put out over so much of the area as will serve to permanently stabilise the slopes, have grown sufficiently to play their part, and the rapid rush of water will become a thing of the past.

Wind-breaks.

When the forest is being created with a view to preventing hail-storms or to break the power of high winds, dams and similar constructions will not be required, and the planting alone will be undertaken.

Tropical luxuriance

In the tropics, thanks to the luxuriant growth of vegetation, dams and retaining walls will only be required where the slopes are so denuded that there is insufficient soil and stability to support tree-growth. Planting or sowing can often be dispensed with and it will suffice to protect the area against fire and against grazing. In many localities it has been proved that a stone wall or a stout fence will establish a luxuriant growth, even in the most unpromising places.

Insects and Fungi.

Hitherto I have made but fleeting reference to the results of attacks by insects and fungi. Though these agencies have caused a great deal of injury in Europe, America and to a certain degree, in Northern India, in our forests, so far, we have escaped heavy loss.

Teak defoliators at Nilambur

A certain amount of injury is experienced in the famous teak plantations of Nilambur through the action of the caterpillars of two kinds of moths (*Hybloea pueraria, and Pyra usta Machaeralis*) which defoliate the trees at certain seasons. Defoliation of course, causes a serious diminution in the growth of the tree. This means either a smaller volume yield of timber at the age of felling, or the retention of the crop for a longer period to ensure the trees attaining the desired size. In either case, it is clear there will be financial loss; either direct or by loss of interest owing to deferred exploitation. To a certain extent such depredations can be checked over small areas and in nurseries in the several ways employed against similar attacks on field crops, which, doubtless, are familiar to you. They are not usually applicable over large areas of forest and, so far, we have had to endure the evil.

Agusti Nowgam.

Arbela tetraonis

One other instance is known to me and it combined the action of three different agencies that cause injury to forests. I refer to the invasion of the Casuarina plantation that served to protect the village lands of Agusti Nowgam in the Ganjam District, which I have already had occasion to refer to, by the moth known as *Arbela tetraonis*. The caterpillar of of this moth devours the bark and cambium of the Casuarina and also of some other trees. If several larvae attack the same tree and at about the same level there is grave danger of the tree being girdled and killed. In the first instance attempt was made to keep the pest in check by collecting and killing the caterpillars. The invaders were so numerous, however, that it was very soon realised that this measure was inadequate. Thereafter every tree attacked was felled and immersed in the backwater hard by. Whether this step would have proved effective I am unable to say, as the sequel will show.

Trichosporium vesiculosum.

At the time the insect attack was being investigated the presence of a fungus on many of the trees was observed, and its determination was referred to Dr. Butler at Pusa. That officer was good enough to come in person to make a closer study and discovered that we were now faced with an even more serious danger than the *Arbela* caterpillars. The only remedy was to remove the attacked trees still faster and to uproot those showing evidence of the presence of the fungus. Not long after, the problem was removed from the hands of Forest Officers by an even greater and more sudden visitation. A cyclone supervened and after its passage the remnants of the plantation were not worth bothering about.

Cyclone.

"Spike" of Sandal.

I have not touched so far on another great danger that is threatening the extinction of our most valuable wood. I refer, of course to the mysterious phenomenon known as the 'Spike" of sandalwood. I hesitate to term it a disease, for no one yet has discovered the cause. One fact is clear in many localities the sandal suddenly assumes a curious appearance, the leaves become very small and are crowded near theends of the branchlets, and the whole tree gives an impression of unsoundness. In the great majority of cases, if not indeed in every case, the trees affected die. The cause of this condition is still unknown, but the latest research seems to indicate the presence of a bacterium.

Principles of Forest Management.

The protection and conservation of a forest does not mean that it is to be left intact and unexploited. Rather, as pithily expressed by ex-President Rossevelt, it is to be "conserved by a wise use." Unless it is a protective forest or unless it has been allowed to become so degrated as to require absolute rest, there is no reason why any forest should not be exploited within limits to be prescribed according to its circumstances.

Normal forest

The ideal forest is known technically as the normal forest. That it is to say a forest that is fully stocked with trees of all ages each age represented by a proper number of individuals so as to ensure its permanency, and the individual trees as fully developed as the nature of the soil and climate will allow. Actually, such an ideal forest is non-existent, there is always an excess of certain classes and a corresponding shortage in the others or the area is not fully stocked, or the growth is deficient. It is the object of the forester to maintain his forest as near to the normal as possible. It follows that his management will depend upon which age classes are in excess and which are deficient. It is clear that to secure permanency in the forest there must be a sufficient number of young plants coming on to take the place of the mature ones eventually, and that the younger the plants the larger in number they must be. The older the tree the more room it occupies, so that there will only be a few old mature trees to the acre. On the other hand, it is very desirable that the soil should be exposed as little as possible, and with that object the canopy is maintained as nearly closed as may be.

I have already explained that the complete stratum formed by the crowns of the trees of a forest is technically called its canopy.

Canopy.

The canopy may be closed, where the crowns of the trees touch each other all round, or it may be more or less open, that is to say that there are gaps here and there that let in direct sunlight.

Gradual reduction in number of stems.

The young plants, of course, cover far less space individually than the older ones; to maintain a closed canopy, therefore, and for other reasons to be mentioned later, a large number of young plants are necessary. It follows that in the normal forest the most numerous plants must be those of young plants are necessary. It follows that in the normal forest the most numerous plants must be those under one year in age and the least numerous will be those that have attained the maximum age, that is, the age at which the trees are felled. The intermediate ages will be represented by a gradually diminishing number from the youngest to the oldest. Not all the young plants can come to maturity; the majority must disappear during the life of the crop, either by suppression by their neighbours or by felling.

We have already learnt that only so much should be taken out of the forest as is replaced in the same space of time by natural growth. Therefore, only that number of trees may be removed yearly as reach the age fixed for felling in each year.

Restoration to normal state.

These observations will indicate to you the line the management will adopt in order to bring an abnormal forest to the normal condition. If the abnormality takes the direction of an excess of trees of the older age classes, the management will remove yearly a somewhat larger number of the older trees than would be permissible in a normal forest. At the same time every effort will be made to increase the number of the youngest plants In the converse case, fewer old trees would be removed than would be prescribed in a normal forest.

Fundamental principles of sylviculture.

Fundamentally, sylviculture is based on two great principles: the struggle for existence, and the struggle for light.

Struggle for existence.

The struggle for existence eliminates the weaker members of the community, leaving the fittest to survive. In a well-managed forest there will always be a considerable competition for light and space between the individual trees. The number of young plants is far in excess of the number that can find support and growing space a few years later. This, as we have seen, is necessary for the maintenance of a closed canopy. In the struggle, the fitter individuals. that is in this case the more robust and quicker growing plants, gain the mastery and grow up above their less efficient competitors, and shortly suppress them. The suppressed ones die out gradually, but in the meantime they have not existed in vain, as we shall presently see.

Struggle for light.

The second principle now comes into play. All green vegetation requires light for its growth and will strive to reach it if possible. In a crowded forest the tops of the plants alone receive direct sunlight and in their endeavour to obtain more the stems grow up rapidly striving to thrust their crowns into greater prominence. All cannot succeed; the better fitted achieve their object and presently overtop their neighbours. In course of time the latter are suppressed and either die outright or linger on without growth. They have, however, played their part in forcing up the new dominant stems and even now serve the purpose of shading the ground and also the stems of their successful rivals until they finally die out or are removed by the forester.

Natural pruning.

The shading of the dominant stems has this value; the trunks of trees exposed to direct sunlight are apt to throw out stem branches, technically called "epicormic branches". These are usually undesirable in forestry since long clear trunks free of knots and unforked are usually in demand.

Too protracted and intense a struggle, however, is undesirable, for even the eventually triumphant stems may suffer from the stress, and also it may not be the most desirable individual, from the Forester's point of view, that will prove successful in the upshot. For this and other reasons which we need not go into, the management will interfere when the struggle becomes too acute and will encourage the growth of some by removing those trees that interfere with their free development. Such operations are termed thinnings.

Thinnings.

Meanwhile, the dominant stems are growing rapidly and their crowns expand vigorously in the space and light they have gained for themselves, till presently their crowns close with one another and the struggle for mastery and light begins afresh and continues by such steps until the term of the life of the crop, their number thus gradually being decreased by suppression and felling, while those left increase in size and occupy more and more room.

Periodically renewed struggle.

Of course, all trees do not insist on light to the same extent Some will not tolerate any shade, others will get on well under a moderate cover and others, again, can support a considerable amount of shade, even thriving without any direct sunlight at all, as in the case of a number of evergreen species found in the *Sholais* of the South Indian mountains.

Demand for light.

Some again will support much shade when young and become intolerent of it later on. These peculiarities must all be considered by the sylviculturist and are made use of an occasion, as for instance when underplanting with shade bearing species.

Pure versus mixed crops

Further, certain species will grow gregariously and form pure crops, whereas some will only thrive satisfactorily when mixed with other species. The advantages and disadvantages of pure and mixed crops have to be considered before coming to a decision as to which is to be adopted.

Pure crops

Pure crops are simpler to manage as the peculiarities of one species alone have to be provided for; the precise quantity of one kind of timber only may be grown.

Mixed crops.

On the other hand, a mixed crop makes fuller use of soil and space and of the variations of the soil and a larger total yield can be obtained; the canopy is more complete and the soil less exposed; there is less danger of the soil being rendered toxic; the danger from insect and from fungoid attacks is less to be feared; a larger variety of produce is obtained to meet the various demands.

These are some but not all of the arguments in favour of the one or the other alternative.

How to keep fit in the Forest Department.

Exuerint sylvestrem Animum, cultuque frequenti,
In Quascunque voces artes, haud tarda sequentar.:—Virgil.

They change their savage mind,
Their wildness lose, and, quitting Nature's part,
Obey the rules and discipline of art—A translation.

There are many problems in this life which give us much cause for thought and the greater the gulf between our ideal and the real, the more bitter the disappointment. One of such problems for a forest man is how to keep fit in his department. The ideal is that the environment of a forester is the presence of the great unknown—Fragrant Zephyrs, sublime scenery, grand waterfalls, innocent conversations with birds, and pure free thoughts. I have often felt great pleasure in watching a dancing mountain brook, in scanning the various transformations of clouds over the nearest hills, and hearing the warbling of birds in mid-air. So must be the case with many in the department—if not all. Now stares before us the real. The problem of good health, the problem of securing proper servants, the problem of making the camp life nearest the home life—these are always with us. Of these and many others the most serious is the problem of good health. The best fitted man for this service is not exempt from the ever present sickness of malaria, which comes to most of us sooner or later in the Forest life.

The various methods of warfare employed in making the real approach the ideal, differ in each case. It is a matter of individual thought and action. So also is in the case now at issue—How to keep fit in the Forest Department.

I herein describe some of the methods I adopt, and though they may not be the best, yet they seem to bring me near to my ideal; and I hope this piece of information will elicit from my readers other interesting and perhaps more beneficial methods.

The first thing each forester should learn to cultivate is a systematic living and systematic work. Nothing pains and irritates nature—we are all children of nature—more than an unsystematic and non - co - ordinated life. Watch nature and you will find she does every thing in her proper season and time. With a system of regular habits, you attain cheerfulness. And cheerfulness to a large degree brings sickness under control. Next is to cultivate boldness. There are more cases of sickness due to nervousness than due to real causes. You go to a certain camp with a premeditated hypothesis that that camp is extremely unhealthy. This imaginary fright dispels cheerfulness, and acts through the nervous system badly on the heart. If one only consults any natural history society, he would hear of many untimely deaths—deaths that have no business to occur—from bites of non - poisonous snakes. There is absolutely no iota of poison injected by the bite of some snakes, all the same the patients die. In these cases no symptoms of Toxaemia are seen but of cardiac depression due to fright. So many of us when we camp in very unhealthy parts of the jungle, become nervous, the result of which brings the blood to low pressure, when the blood is not at its best condition, as we all know, the germs of malaria which are dormant wake up and play havoc with us.

So much for the mental side of things. Now I go on to the physical side which is in many, perhaps, more easily attainable than the cheerfulness and intrepidity of mind I have spoken about. It goes without saying that every forester should sleep under mosquito netting and drink boiled water. It would be preferable if the water is aerated, say, by means of a sparklet syphon. With the advent of the Special Forest Engineer one can expect a supply of better drinking water along with the other developments, such as, communication of road and modern means of exploiting and transporting of timber. I know of some very unhealthy camps on the Javadis which have been made fairly healthy by the introduction of bore - wells—or otherwise known as "tube - wells". The next important thing is to take quinine regularly for two or three days a week. Quinine is our only saviour and panacea for all diseases which the flesh of a forester is heir to.

Different methods of administering quinine into the system are practised by us—viz., Hypodermic injections, sugar tabloids etc. But the best way I feel in taking is by mixing some Equinine

(quinine ethylcarbonas) in morning coffee or milk. Equinine is tasteless and does not give us the creeping sensation attending on taking pure quinine, or the dangers of a complication as in cases of injections. After a certain amount of quinine is in your system, the taking may be decreased to one day a week. Next point to be observed to keep good health is to keep your bowels regular and clean. This is a very important item and in cases of deliquencies, Eno's Fruit salt or some saline mild purgative should be administered. I also strongly recommend a daily bath—I mean a complete bath—and a hot bath too. It is with greatest advantage taken in the evenings and the water should be hot in direct proportion to the chillness of the weather. I have found in camp a bath in the evening does much more good and produce a sounder sleep than a bath in the morning.

I shall now get on to things to be done when we are out actually in the forest. The less you drink when you are out, the better. If it is a tiresome march of inspection, take as soon as you return to camp barley water or some milk and "Ovaltine". Strong drinks such as liquors only take away our health rather than give it. I know in some of us there is a fallacious idea that "King George IV's" and "Jhon Exshau's" are quite essential for a forester. Another important thing one should do is to "change" soon after reaching the camp. The best of healths will fail when you allow the cloths of the field to remain on you even when you reach your camp.

In the evenings after your bath and your dinner (mountaineers and beggars, it is said are always hungry) when you smoke a pipe or a cigar reclining on your easy chair with a novel or newspaper in your hands after a hard day's work, you cannot but prepare yourself for a sound and invigorating sleep and you wake up the next morning in the best of health. And soon if you repeat your habits, sure as morning follows night, there will be more and more healthy mornings with the result that you keep fit and justify the spirit of motto quoted supra.

Gundlabrahmeswaram, G. N. SUBBA RAU, B. A.,
(Kurnool Dist). *Range Officer.*

My favourite tree

("Early friendship takes a deep root")

Second essay for the "Indian Forester Prize" for 1923 *for Students of the Madras Forest College* 1921-23 *Division.*

By Mr. Kuttappan Pillai.

An almost bewildering multitude of species is one of the essential features of our Indian forest vegetation. The Foresters in Europe and America have only to deal with comparatively limited number of species which generally grow in pure crops, and research and experience extending over more than a century have afforded them ample scope for a thorough acquaintance with these few species which compose their crop. But a study of the beautiful forests of our Indian peninsula exhibiting endless variations in their composition within their comparatively narrow limits presents problems of a most intricate nature. Moreover the dealings of the ordinary forest officer seldom extend beyond a few species such as teak and rosewood which become intimately connected with the life of man in India from very early times. The Indian forest flora includes, besides the above, a very large number of timber trees of equal or greater importance, but unfortunately, their value has not yet been recognised and the vast majority of them are still classed under the so called useless species owing to our total ignorance. The average Indian subordinate forest officer's knowledge of the species which he has to deal with is therefore far too little to enable him to develop any reasonable likes or dislikes for any of them in particular. His position is no better than that of a young boy who suddenly becomes the master of a large property.

Now, the selection of a favourite tree had been engaging my attention for a long time without any success, until one day the sweet recollections of my boyhood brought me to that old favourite tree of mine for which I had unconsciously developed a liking from the days of my very infancy. Those delicious fruits and seeds in the dispersal of which I took great interest during my very early years, have left an ever lasting impression on my mind.

General. The ordinary jack is very common in the plains of India and rarely requires any introduction. Every Indian household has something to do with it, and even outside India the tree has not failed to establish a reputation for its delicious fruits. The tree is botanically known as *Artocarpus integrifolia*, and belongs to the natural order Urticaceae. The genus contains a very large number of fruit trees and hence the name Artocarpus (*Artos* = Bread and *carpus* = fruit). The wild jack and the bread fruit tree all belong to this genus. The specific name originated from the entirety of the leaf margin. The word jack has its derivation from "chakka" a local vernacular (Malayalam) term meaning jack fruit.

This is a large evergreen tree with a short thick bole and dense rounded crown. The leaves are thickly coriacous, dark and shining above, and pale below. Bark is smooth dark brown, and mottled green and black. Flowers are crowded on unisexual spikes

Distribution and habitat. It is widely distributed in India and Ceylon and is indigenous in the western ghats. It is extensively cultivated for its fruits. The species was introduced into Jamaica by Admiral Rodney in 1872, and it has also been introduced into Brazil, Mauritius and other countries. There are about 40 species in the genus all of which are evergreen and inhabitants of the tropics.

Soil. It can grow on almost any soil but prefers a deep rich red loam. It grows even on stony and shallow soil unsuited for other crops.

Climate. The species requires a moist tropical climate. In the western ghats it grows up to an elevation of 4000 feet.

Reproduction. One of the chief difficulties experienced in the study of the reproduction of forest trees is the identification of the seedlings. But the seedlings of jack even children know. It is best reproduced artificially. The seeds are sown *in situ*, or seedlings raised in baskets or pots because it does not stand transplanting owing to its delicate tap root. Seeds soon lose their vitality and as such should be sown fresh at the commencement of the rains. They should be watered regularly during dry weather. The seedlings in baskets are ready to be put out into the forest at the beginning of the rainy season. A pit is dug and into this the seed is inserted. In parts of Travancore the entire fruit is planted and when the various seeds germinate and grow up the shoots are tied up with straw. They then grow up into one stem and bear fruit in 6 or 7 years.

Germination. hypogeous; the radicle emerges first, and the cotyledons are unequal. The smaller cotyledon separates from the large like a valve enabling the young shoot to make its way up between them.

Sylvicultural characters. The total absence of the species from the forest flora in many parts of the country accounts for the little attempt made at the study of its sylviculture by the Indian foresters. It can stand a considerable amount of shade but better development is possible in full light. It does not mind the sun provided the soil is moist. It is sensitive to drought, and is also very forst tender. It coppices well. The growth is slow at first but is rapid later on. It is windfirm on account of its long tap root.

Rate of growth:- The tree attains generally a girth of 3' in 15 years. In many cases there will be two to three rings per inch of radius Generally the tree attains a huge girth but height growth is comparatively small.

***Flowering*:-** The Jack tree flowers from December to March, or throughout the year in exceptional cases. Flowers are monoecious, male and female forming distinct axillary and solitary spikes. Ovary is rudimentary in male flowers.

Fruiting. The tree bears fruits generally at the age of 7 years. Fruits generally appear from April to June and rarely during the remaining months also. The structure popularly known as fruit is really a collection of fruits produced by a collection of flowers, the individual fruits being spoken of as flakes. Fruits ripen during rainy season. Each fruit contains 60 to 90 or more flakes of a soft juicy substance. The average fruit measures about 2½′ × 3′ (girth) and weighs from 30 to 60 pounds. If the seeds be taken to weigh about ⅓ ounce, one fruit will yield about 30 ounces of flour and a tree will yield annually about 900 ounces.

Injuries:- The tree is damaged by the larvae of a moth *(Perina nuda)*. Cattle readily browse the plants which are generally fenced round to prevent such mishaps. Men and animals eat the seeds and thus interfere with natural reproduction. Fruit is attacked by certain insects during the course of development.

Method of treatment. At present the Jack is sparsely distributed in our forests though it is one of the commonest trees in our Indian villages. The species has therefore not yet been subjected to any sylvicultural method of treatment. The propagation of the species is now undertaken by the horticulturist but this beautiful tree deserves better treatment at the hands of the sylviculturist.

Utilization:- The common Jack is a tree of immense utility to the Indian public who, I hope will not fail to realise this fact. Every part of the tree is put to some use or other and it occupies a high rank among the fruit trees of India perhaps next only to the Mango and the plantain,

The tree. with its dense foliage affords shade along road sides. It is a sacred tree often seen on Badhistic sculptures.

Leaves. Form fattening food for cattle and also for elephants. The tender leaves are used in skin diseases. Leaves folded to shape take the place of spoons on the west coast. Dry leaves burnt to ashes form manure for field crops.

Fruit Is the most attractive part of the tree to the ordinary villager, and is in India an important article of food both when green and ripe. The poor people in some parts of the country depend entirely on this for food during certain parts of the year. There are two varieties of fruits ordinarily recognised on the west coast. In the case of one the perianth lobes begin to decay soon after maturity, the flakes are not very sweet and do not contain honey while the opposite conditions prevail in the other variety. The latter is priced better.

The fruit is very nutritious, but difficult to digest. The unripe fruit is astringent and the ripe laxative. All parts of the unripe fruit except the outer rind is cut into pieces and cooked in curries with shrimps. The ripe fruit is very sweet though there is a general impression that the Europeans do not like it on account of its peculiar odour. This odour is due probably to the presence of butyrate of ethel (Mr. C. F. H. Warden Calcutta.) The juicy sweet flakes if fermented and distilled yield an alchoholic beverage with a strong odour and peculiar flavour. The fruits from near the roots are valued more for their better taste. Rind of the fruit is eaten by cattle.

Seed. Contains starch which may be separated by drying and pounding and can be used in a variety of ways as food. It is very nutritious and resembles in taste the Spanish chestnuts. It is very palatable when roasted in hot ashes, and very often one could find the children in Malabar collecting around the hearth and engaged in the above operation.

Juice or Sap. Is sometimes used to promote absorption of glandular swellings. It yields caoutchouc which is elastic leathery, water resisting, and capable of removing pencil marks. A kind of bird lime or cement is also obtained from the juice. The juice of green jack fruit boiled with lime etc. yields a red dye and this is employed in dyeing jute and cloth used in tying bombs. Juice of bark with certain roots (Acorus) is ground and applied in dimness of vision. It is a favourite pastime for children to catch small birds with this sticky juice.

Root. A decoction of the root of this species is administered internally for diarrhoea. A yellow dye is obtained from the roots in Sumatra (Balfour). Root of old trees contains a dark coloured wood used for picture frames. Root juice and sugar pounded with the pulpy aril surrounding the seed is smeared on chest in heart burning.

Bark. Yields a very dark looking gum with a resinous fracture which is soluble in water. A dye is extracted in Oudh from the bark. The bark also yields fibre. A fibre extracted from bark was sent to the Parish exhibition from Sandoway. In Kumaon a cordage fibre is extracted from the bark. Sometimes the bark forms food for elephants.

Wood. The tree yields one of the best Indian funniture wood and this has attracted the attention of our house builders.

There are very few species which can excel that beautiful yellow colour which the jack wood posesses. It is yellow when freshly cut gradually changing to Mahogany colour on exposure. Medullary rays are well marked, moderately broad and not numerous. Seasoned wood weighs 42 lbs per cubic foot. Its coefficient of transverse strength is 793. It takes a fine polish and is largely used in boat building, furniture making, making musical instruments and grain measures and also in ornamental work. A yellow dye is obtained by boiling the wood or sawdust which is used to dye the cloths of Burmese priests. The yellow dye thus obtained, fixed by alum and intensified by turmeric is used for ordinay purposes. It yields a green with indigo and this is said to be used in Malda. Kanthal yellow is used in dyeing silk.

A tree of such wide distribution and immense utility and also one which occupies a high rank among important fruit trees of the world, the ordinary jack soon develops a friendship with any one that comes in its way. I hope the tree will soon find as sincere a friend in the sylviculturist and horticulturist as in me.

Botanical Curiosities.

1. *The smallest flowering plant in the world:*

Among the Lemnaceae (Duck-weeds) which represent the most reduced forms of the Spadiciflorae, there is a plant called *Wolffia arrhiza*. This is the smallest known *flowering* plant in the world. It has no roots, no spathe, and only one flower.

* * * *

2. *The largest herb in the world:*

The *plantain* is, in the botanical sense, a herb, and the largest known herb. What looks like an aerial 'stem' is really no stem, but a collection of sheathing leaf bases encircling the tall peduncle of the inflorescence. The stem is underground.

* * * *

3. *The largest tree in the world:*

This is *Sequoia Washingtonia:* (the Mammoth tree of California.) "The tallest tree of this species found by a hunting party in 1850 in Upper California, was 327 feet high, and 90 feet in girth at the base... ... ..."

* * * *

4. *The largest known flower in the world:*

The flower of *Rafflesia Arnoldi* first made known in 1818 in Sumatra by Dr. Arnold, is the largest known. It was described as "more than a yard across, the petals or lobes of the perianth as being a foot long and $\frac{1}{4}$" to $\frac{3}{4}$" thick, and the cup of the flower as calculated to hold 12 pints. The weight of the whole flower was estimated at fifteen pounds"——(Treasury of Botany.)

* * * *

5. *A tree with a very large and spreading crown, but a very small seed*:

This is Ficus spp., especially *Ficus bengalensis, Linn.* "The famous banyan tree in the Royal Botanical Gardens, Calcutta, which was ascertained to have grown from a seed deposited in the crown of a date palm in 1782, had, according to Col. Prain, the following measurements in 1900:—

Circumference of the trunk	...	51 feet.
,, ,, crown	...	938 ,,
,, ,, height	...	85 ,,
Number of rooted drops	....	464

* * * *

6. *A tree with a small crown, but a very large seed*:

The Cocoanut palm is an example.

* * * *

7. *A plant with only a pair of leaves:—*

This is *Welwitschia mirabilis* belonging to the order Gnetaceæ. It resembles a giant radish, in that the hypocotyl is the only part of the main axis of the stem which becomes developed.

It attains a circumference of more than 13 feet with a length of 1¾ to 2 feet. It bears *only* two oblong leathery leaves which are torn into segments at the apex, and lie on the surface of the soil ; these are the two first foliage leaves which succeed the cotyledens, and they are remarkable for their enormous length (more than 6 feet) as well as for their long duration, living as long as the plant itself (about a hundred years.) The plant grows in the deserts of South Western Africa.

* * * *

8. *The lightest wood in the world:—*

This is *Ochroma Lagopus* or *Balsa*: "Known as the Cork tree of the West Indies where it is commonly employed as a substitute for Cork. The very buoyant rafts or 'balsas,' the unsinkable properties of which caused much surprise among the discoverers of America are likewise made of it, whence the tree is called 'Balsa' in some parts of America." — (Treasury of Botany.)

The wood weighs only 7 lbs. per cubic foot. In this connection it would be interesting to compare this with the weight (in lbs.) per cubic feet of Hardwickia binata (the hardest and heaviest wood in India) which is 84, that is, twelve times as heavy.

Givotia rottleriformis is perhaps the "balsa of India" as it is the lightest Indian Wood, weighing but 14 lbs. per cubic foot, only a trifle heavier than cork.

—*Editor.*

[*To be continued.*]

Prismatic Compass Survey.

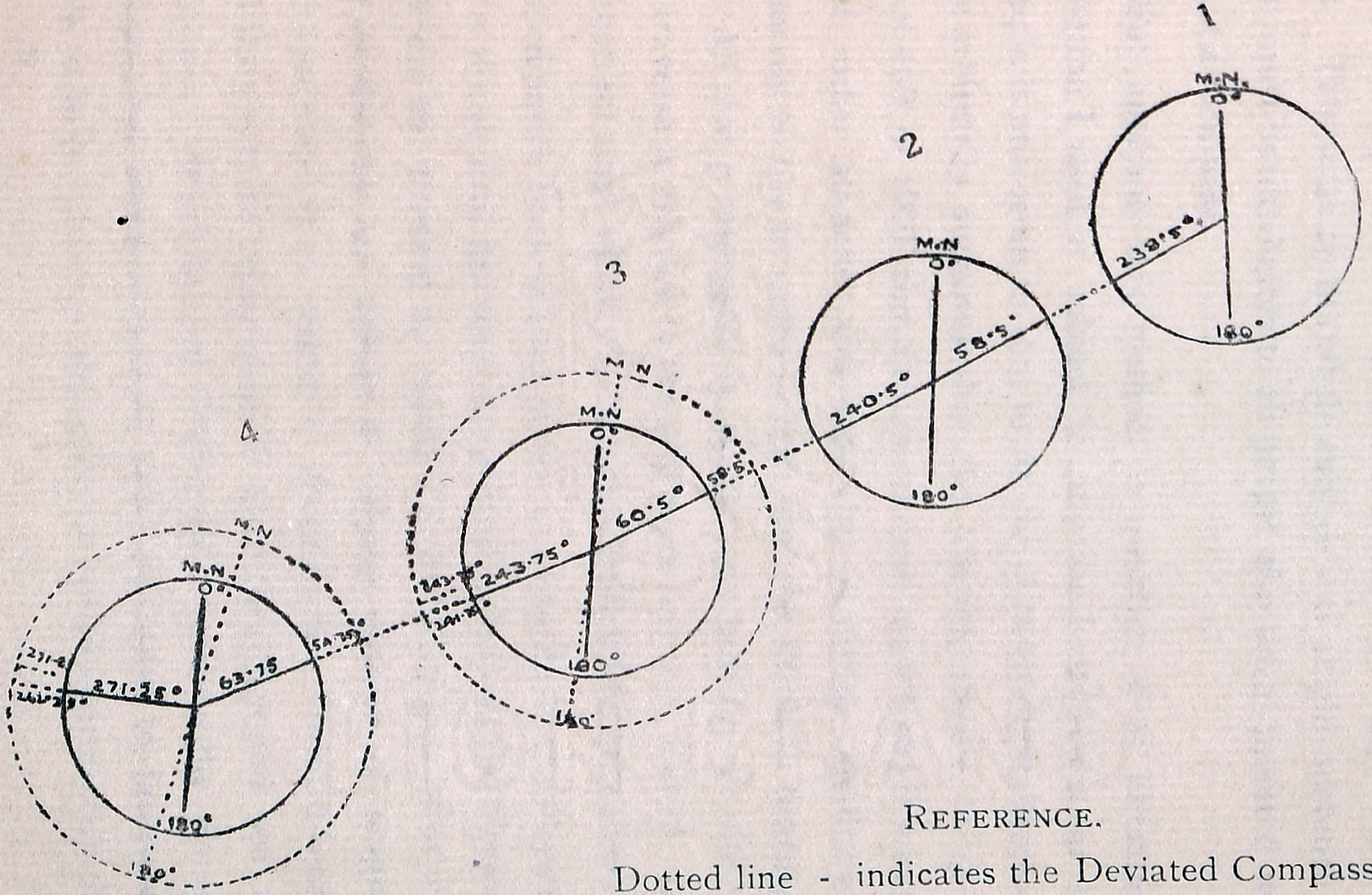
One of the difficulties encountered in Compass survey is the fact that some-times the Back-bearings do not correspond with the respective Forward-bearings. Under such circumstances almost invariably the inexperienced surveyor thinks that the fault is in himself, i. e. he thinks either that he must have read the bearings wrongly or that he might not have placed the compass exactly over the stations, or, that he might have committed both mistakes, and proceeds somehow to adjust the readings, or if he is less unscrupulous, he might take the bearings once again to eliminate the errors due to himself. Even supposing he eliminates the personal errors, still sometimes the Back-bearings will not tally with the corresponding Forward-bearings. In such cases, very often the Surveyor overlooks the differences indicated by the compass, and proceeds to do the plotting as if everything was alright or gives up the survey as a hopeless task, or might resort to the use of the Plane-table and orient the table by means of the back-angle method, dispensing with the declinator. The object of this article is to show that he need not resort to any of these alternatives, that the difficulty is not an unsurmountable one, and that it is possible to carry out an accurate survey in spite of the seeming obstacle.

It is needless to point out that the principle of the compass-survey is based on the fact that the compass needle points in the same direction when placed on the different stations included in any particular traverse, or in other words, the position of the compass needle on any one station is parallel to its positions on the other stations. This will be the case if all the stations are subject to the same magnetic influences. If any two successive stations are not subject to the same magnetic influences then the position of the compass needle on one station will not be parellel to its position on the other, and naturally the Back-bearing from the 2nd station will not correspond with the forward bearing from the 1st station, and if it is supposed that the first station is subject to the normal magnetic influence, then it follows that the 2nd station is subject to some abnormal influence. The difference between the actual Back-bearing and the Back-bearing as it should be, will indicate by how much the compass needle was deflected from its normal position by the abnormal magnetic influence on the 2nd station; so any bearing taken from this 2nd station will vary from the normal or correct bearing by an amount equal to the deflection of the needle from its normal position, and whether the correct bearing from station 2 ought to be more or less than the actual bearing will depend upon whether the actual Back-bearing from that station is less or more respectively than what it ought to be. If the actual Back-bearing from station 2 to station 1 is more than what it ought to be, then the true Forward-bearing from station 2 to station 3 will be less by an equal amount than the actual Forward bearing. Again whether station 3 is subject to any abnormal magnetic influences or not will be determined by a comparison of the actual Back-bearing from station 3 with the true or derived Forward-bearing from station 2. If the difference between the two is not 180° then it follows that at station 3 also, the magnetic influences are not normal. If the difference is exactly 180° then it means that station 3 is subject to the same magnetic influences as station 1. So the actual forward bearing or for the matter of that any bearing taken from station 3 will be the true or normal bearing, and will require no correction. If on the other hand the actual Back-bearing from statian 3 differs by 180° from the actual (not true or derived) forward bearing from station 2, then it does not mean that everything is alright with station 3 but it means that it is subject to the same abnormal influences as station 2. So any bearing taken from station 3 will still require correction. In such a case the correction will be the same as that applied to the forward bearing from station 2. If the actual Back-bearing from station 3 is more or less than the correct Back-bearing, then the true Forward-bearing from that station will be respectively less or more than the actual Forward-bearing by an amount equal to the difference between the true Back-bearing and the actual Back-bearing. The following extract from Field Book and diagrams will make the subject more clear:—

Extract from Field Book.

Fd. Bg.	262.°25	to 5
	4	
Bk. Bg.	54·°75	to 3
Fd. Bg.	241·°75	to 4
	3	
Bk. Bg.	58·°5	to 2
Fd. Bg.	240.°5	to 3
	2	
Bk. Bg.	58.°5	to Stn 1.
Fd. Bg.	238·°5	to Stn 2.
	1	

Now let us suppose station 1 is subject to the normal magnetic influence. The difference between the Forward-bearing from **1** and the Back-bearing from **2** is 238·°8—58·°5=180,° i. e., it is what it ought to be. So station **2** also is subject to the normal influence. So the Forward bearing from **2** which is 240.°5 requires no correction. But we see that difference between the Forward-bearing from **2** and the Back-bearing frem **3** is 240·°5—58·°5=182°, i. e., 2° more than what it ought to be. The true back bearing should have been 60·°5. That means division 58·°5 stood where 60.°5 should have been. Vide figures 2 and 3. This is due to the North pole of the needle having been deflected 2° east from the normal position. So while taking the Forward-bearing from **3** we use a needle which is deflected 2° East. The actual Forward-bearing from **3** is 241.75; had the needle not been deflected from the normal position division 243.75 (241.75 + 2) would have been in the line of sight. So the true Forward-bearing is 243.°75 which is 2° more than the actual Forward-bearing (please note that the actual Back-bearing is 2° less than the true Back-bearing from station 3.) The actual Back-bearing from station 4 is 54.°75 to **3**. It should have been 63.°75 (243 75—180.) That means that division 54.75 stood in the line of sight instead of division 63.75. That shows that the north pole was deflected from the normal position 9° east (to the right) when it was placed on station 4. The forwarding-bearing from **4** is 262.°25. Had there been no deflection, division 271.25 which is 9° to the right of the line of sight would have been in the line of sight. So the true forward bearing from **4** is 262.°25 + 9 (the deflection) = 271.°25 In this way the true bearings of all the sides of the traverse could be derived and the survey plotted correctly. If correct Forward bearings are derived like this for all the stations, then it would be found that the actual Back-bearing from the 1st to the last station will exactly correspond with the derived Forward-bearing from the last to the 1st station, however great the discrepancies might be between the derived Forward-bearings and the actual Back-bearings between other stations in the middle of the traverse. It is clear now that *when the back bearing from any station is less than what it ought to be, the forward bearing from that station must be more than what it actually*


1
M.N.
0°
238·5°
180°
2
M.N
0°
58·5°
240·5°
180°
3
M N
M.N
0°
60·5°
58·5
243·75°
243·75
241·75
180°
180°
4
M.N
M.N
0°
63·75
54·75
271·25°
271·2
241·25°
180°
180°

REFERENCE.

Dotted line - indicates the Deviated Compass.
Whole line - ,, Correct Compass.
1, 2, 3, 4 - ,, Compass Stations.

needle which is deflected 4° East. The actual Forward-bearing from [illegible], had the needle not been deflected from the normal position [illegible] 264·75 (261·25 + [illegible]) would have been in the line of sight. [illegible] Forward-bearing is [illegible] is 2° more than the [illegible] (proves this that the actual Back-bearing is [illegible] the true Back-bearing from [illegible]. The actual [illegible] from station [illegible] 33 [illegible] it should have been [illegible]. This means that [illegible] stood in the [illegible] points [illegible] the north [illegible] deflected [illegible] 9° east (to the right). [illegible] Forward-bearing from 4 is [illegible] had there been no [illegible] which is 9° to the [illegible] on the [illegible] in the line of sight. So the [illegible] Forward bearing [illegible] 273·25 [illegible] the north-end [illegible] of the magnetic needle be [illegible] and the actual [illegible] Forward bearings [illegible] for this [illegible] it would be found that the actual Back-bearing from the 1st to the last station will exactly correspond with the [illegible] Forward-bearing [illegible] station to the 1st station, however great the discrepancies might be between the derived Forward-bearings and the actual Back-bearings, [illegible] other [illegible] middle of the [illegible]. It is [illegible] when the *back bearing from [illegible] is less than what it ought to be, the forward bearing from that station must be more than what it actually* *is, by an amount equal to that by which the Back-bearing is less and vice versa.* This sums up the whole subject in a single sentence in a way that must be intelligible to all people who are acquainted with the Prismatic Compass.

For applying this method in practice, it is immaterial whether station **1** itself is subject to any local attraction or not. The principle is analogous to that made use of in levelling where one sometimes arbitrarily supposes that the starting station is at an elevation of 100' or 1000' above mean sea level, and then derives the heights of other stations and does the plotting. Similarly in compass survey no one proposes to find out the absolute bearing of any line. All that is attempted is to find the bearing of different lines in a traverse in relation to the bearing of any one line so as to obtain the correct angle which any two lines make where they intersect.

Ordinarily Back-bearing serves as a check on the Forward-bearing i. e. if any error has been committed in taking the Forward-bearing it will be detected by taking the Back-bearing. But when the different stations are subject to varying degrees of magnetic attraction, then there is no means of checking the Forward-bearing and one will have to be very careful in taking bearings and see that no error occurs. Otherwise any discrepancy between the Forward and Back-bearings which might fully or partly be due to faulty work is all liable to be put down as being due to the local attraction alone and in such a case the method herein described will not obviously serve one's purpose. Because the method is meant to rectify discrepancies due only to varying degrees of magnetic influences and not those due to faulty work.

The method described here was successfully made use of in the course of a survey, by the students of Madras Forest College, of a fuel coupe in Bolampatty Reserve where there was unmistakable evidence of local attraction, and the work of surveying and plotting the coupe seemed a hopeless task. This article is written in the hope that it is likely to be useful to Range officers and others who have always to survey coupes and who might find themselves helpless when confronted with similar difficulties.

C. M. KUSHALAPPA,
Instructor M. F. C.,

[*N. B.* In the next issue a complete field book showing the faulty actual bearings and the correct derived bearings will be published.

C. M. K.]

" The Making of a Topograpic Map—A New Method "

by, J. Kenneth Pearce. B. S. F., Logging Engineer
to Government of Madras.

The planning of modern logging operations in areas of rough and broken, topography, demands accurate maps on a large scale, showing all details of the topography, as contours, streams, ridges, rock outcrops, etc. With such a map every problem of exploitation can be anticipated and solved in advance, the best logging methods determined, and costly mistakes avoided. The old methods of taking topography have proved to be either insufficiently accurate or too expensive if the requisite degree of accuracy is obtained.

The necessity for securing an accurate map at a reasonable cost had led to the development of the "Topographic trailer tape-Improved Abney Level" system of mapping. The mapping set consists of three instruments. The Improved Abney Level, for obtaining elevations, the trailer tape for measuring horizontal distance along the slope, the United States Forest Survey type compass for securing alignment. The *Improved Abney Level* is larger than the usual form and permits more rapid and accurate work. The arc is graduated to give directly, without computation, difference in elevation in feet for horizontal distances of one chain (66 feet). The topographic trailer tape consists of a steel tape of two chains each divided into 166 links, with a trailer about half a chain long. The trailer, and the reverse side of the second chain, are graduated to correspond with the graduations on the arc of the Improved Abney so that horizontal distance of 1 or 2 chains may be measured directly on any slope without calculation or reference to tables. In operation after a trial reading is made with the Abney on the slope along which the tape is stretched, the trailer of the tape is grasped at the graduation corresponding with the Abney reading and the tape pulled taut. Thus a point one or two chains *horizontal* distance from the topographer is located and the Abney reading shows the difference in elevation between that point and the point where the topographer is standing. The unit of a chain was adopted because the original United States land survey was made in that unit and because of the simple mathematical relationship of the chain to the mile (80 chains = 1 mile,) and to the acre (10 square chains = 1 acre).

The United States Forest Service type compass permits a straight line to be run through dense forest with greater speed and convenience than with the prismatic compass. Features of this instrument are: A needle instead of a floating dial; folding sighting vanes; and variation arc permitting the magnetic declination to be set off and true bearings read directly instead of azimuths. The compass is mounted on a ball and socket joint on a sharp pointed "Jacob staff," which is simply stuck in the ground wherever a compass reading is required. All of the instruments are light in weight and easily carried in a leather case attached to the belt.

The successive steps in making a topographic map of a forest area with the above instruments will be briefly described. The first step is to determine the location of the baselines—the backbone or frame work of the map. The following are a few general principles which should be borne in mind;—

The mapping strips should *cross* the contours, not parallel them. A tie to a base line should be obtained on each days run—generally base lines are run at least a mile apart. If the area is traversed by large main ridge and valley systems, the base lines can be most conveniently run along the crest of the ridges or the bottom of the valleys. If it is desired to run the minimum amount of base line, instead of two base lines about a mile apart, one base line through the middle could be used and the strips run out each side for half a mile, offset twice the width of the strip mapped and run back, tieing into the same base line started from.

The best location for base lines having been found they will be surveyed, the method used depending on the accuracy of results desired. The usual method is to traverse alignment with transit and tape, and obtain elevations with wye or dumpy level. It is not necessary that a base line be a straight line. Indeed that is often impossible in the forest. Angle back and forth as necessary to avoid obstacles, endeavouring always to get as long sights as possible. In steep country slope chaining and reading vertical amgles (trignometric leveling) is much faster, but less accurate as regards elevations.

For short base lines a cheap and rapid method of obtaining elevations is to run a "double Abney" line with the mapping instruments, chaining to stakes and using two Abneys, the head and rear chainman checking each other on every shot.

Having surveyed the base lines they should be carefully plotted on detail drawing paper to the scale on which it has been decided to make the map. The scale used will depend somewhat on the size of the area to be mapped but principally on the purpose for which the map is to be used. Scales of 200, 300, or 400 feet to the inch will be found most satisfactory for logging maps. The width of the strips must next be determined. This will depend on the density of the cover and on how far the topographer can see to sketch contours on each side of his strip line. The strip width may vary from 6 chains in fairly open country down to 2 chains in dense jungle. Plot the strips on the "base map," scale off the location of each strip stake from the nearest station on the base line and set the strip stakes in the field. If the base line elevations are to be taken with wye level, the leveling operation shoud be deferred until after the strip stakes are set. If trigonometric levelling is used the elevation of the strip stake may be taken with the Abney from the nearest transit station. The strip stake should be blazed on both sides, the number of the strip and the elevation marked on it, and a small peg driven in the ground beside it on which the elevation is taken.

Make a copy of the base map by pricking the strip stake-points through on to another sheet of drawing paper, and cut this sheet up into strips the exact size to scale, of the strips to be mapped in the field. The number of the strip and the elevations of the strip stake started from and tied into at the other end should be written on each strip. With dividers prick off points 1 chain apart along the centre of the strip.

We are now ready to do the actual mapping. The topographer fastens one of the paper strips to a small sketching board, slips the Abney on to his belt, makes certain that he has pencils and eraser, and with the compassman who has compass, staff, and trailer tape, proceeds to the first strip stake. The compssman jots his staff into the ground, sets the compass on top of it, and loosens the compass needle. He sets the compass on the bearing which he must run to hit the corresponding strip stake on the other baseline, the correct bearing having previously been ascertained from the base map. Looking through the sight vanes, he picks out a tree or other distinguishable object on line as far ahead as he can see. He then tightens the needle, places the compass in the case on his belt, grasps the leather thong on the head end of the trailer tape, and walks straight toward his line tree.

The topographer stands beside the strip stake, his feet on the same elevation as the peg in the ground. He stops the compassman when the latter has gone a distance of one or two even chains. A trial reading with the Abney is now taken, the topographer sighting at the point on compassman face or hat which he has previously found, by trial on some level spot, to be the same height as his eye. Grasping the trailer of the tape at the graduation corresponding to the trial Abney reading, he tells the compassman to go ahead until the tape is taut The compassman is now standing exactly one or two chains (as the case may be) horizontal distance from the topographer, the trailer tape having made it possible to measure to that point, along the slope, without calculation. The topographer takes a final accurate reading with the Abney, to obtain the difference in elevation between the two points. He puts a small cross down on his papers strip to mark the new point, writing beside it the elevation of the point (obtained by adding to or subtracting from the elevation of the strip stake the difference in elevation read on the Abney) Since the Abney reads directly feet of elevation per chain of horizontal distance, if a two chain shot is taken the difference in elevation is obviously *twice* the Abney reading.

The topographer now walks forward to the new point the elevation of which has been obtained, observing the country on each side of him as he goes ahead Reaching the point, he stands in the same place the compassman stood when being sighted at, facing the strip stake he has just left, with the centre line of his paper strip oriented with the compass line. The contours are sketched in exactly as they exist on the ground, using the contour interval decided on for the map. A 20 feet contour interval will be found to be most satisfactory in average mountainous country with steep slopes. In flatter country a 10 feet contour interval may be used, and in extremely steep country and smaller scale maps 50 feet contours interval may be necessary. Using a 20 feet contour interval, the topographer must draw contours at every even 20, 40, 60, 80, and 100 feet rise or fall in elevation.

He must exercise great care in sketching the direction of the contours, so that his strip will match up with adjacent stripe. All streams, trails, rock outcrops, open areas without trees, etc. that occur on his strip must be sketched on the map exactly as they occur on in their true shape. Streams may be indicated with a wavy line terminating in an arrow pointing in the direction the water is flowing. Since the drainage is the agent which forms the shape of country, wearing down valleys and leaving ridges between, all streams should be sketched with the greatest care.

By the time the topographer has completed sketching, the compassman has gone out another one or two chains in a continuation of his straight compass line; and the operation of making a trial Abney reading, grasping the trailer at the corresponding reading, pulling the tape taut, and taking an accurate reading to determine the new elevation is repeated. The topographer goes forward to the new point and again facing the point he has left, sketches in the intervening topography.

When the compassman reaches his "line tree", he again sets up his compass and finds another distinctive tree on line ahead of him, in this manner running a straight line through the forest.

As little swamping of the line as possible should be done as it is quicker to take a series of short shots through than to wait for brush to be cut. I have found a small pocket mirror fastened to the compassman's hat to be great assistance in getting a sight through dense jungle. The flash of the mirror will be plainly seen when the man himself is invisible. A few coolies with the billhooks or kukri knives are advisable in dense undergrowth where the going is difficult but they should not be permitted to impede the rapid progress of the mapping crew.

When the end of the strip is reached on the opposite base line a tie is made to the corresponding strip stake. On the paper strip should be noted the error in line, distance, and elevation. The error in elevation in runnining a mile through rough country should not exceed half the contour interval and will usually be much less. I have found that experienced man, used to working together, will not be out in elevation more than 3 to 5 feet in a mile which, on the scale of the map is almost negligible. If a large error evidences some mistakes, I insist that the line be rerun.

If a single base line is used when the end of the first strip s reached, the compassman turns a right angle, follows this line the width between the strips, turns another right angle, and runs back toward the base line parallel to the previous strip. The tie-in is made to the strip stake adjacent to the one started from.

The completed map is made by pasting the field strips on to the base map in their proper location. An error in direction of the compass line can be corrected by shifting the strip so that its position on the base map is exactly coincident with the direction run in the field. An error in distance due to inaccurate chaining can be adjusted by cutting the strip into sections and lengthening or over-lapping to correct length when pasting. No correction or change is made in the sketching on the strip itself, it being a fundamental principle of engineering that original field notes must never be altered.

A pencil tracing of the entire map is made on tracing paper. Any correction or change to make the contours on adjacent strips connect properly, is done on this tracing, enabling the field strips to be preserved in their original state. When tracing, connect up the streams first, then the even 100' contours, which make it easier to connect the 20 ft. contours. Artificial features as trails, roads, etc., should be traced last. Care must be taken when tracing to preserve all the features of the topography and to not lose the value of a carefully-drawn field sketch by carelessly rounding off contours. Draw heavy lines for the 100 ft. contours leaving occasional blanks for numbering.

The final step is to trace the completed map in ink on tracing cloth, from which as many prints can be made as desired. A neatly lettered title should give the name of the map, location, scale, contour interval, a complete legend, and the names of those who made the map.

Space does not permit the statement of the amazing number of uses of which such a map as has been described is capable. They will readily suggest themselves Every step of the logging operation from the felling of the first tree to the final regeneration of a new forest finds an accurate large-scale map of incalculable value. The small cost of the map is saved many times over by the avoidance of mistakes and the increased efficiency of the operation.

[*Note.* The Senior Division students were fortunate enough to attend a personal demonstration of this method, by Mr. Pearce at Dhoni, and they also spent several days map making by its means. We can endorse all that the writer says about the utility and accuracy of the method, and feel sure that its introduction into India will be very popular. As all the best advertisements say, "No Forest officer can afford to be without one." Its fascination is such that one immediately wants to begin to use it.—C. R. F W.]

Miscellanea.

Rare Tiger Shot.

A TIGER of remarkable rarity, recently shot by the Maharaja of Sirguja is on view at the premises of Messrs Rodda and Company, Calcutta.

Pure, white in colour, excepting for a few stripings, the beast had an outstanding career for depredation before it was finally disposed of. Owing to its white colour it was continually being mistaken for a member of a herd of cows not only by human beings but also by animals. Numerous head of cattle and at least two men are among its victims.

On two separate occasions after it had completed a "kill" it was found lying beside the carcase.

Seeing a white beast sleeping peacefully in the jungle, an Indian one day walked right up to it, thinking it was the animal which had been killed by the tiger. Suddenly the "cow" sprang up and in a trice had the intruder mortally wounded.

A similar incident occurred shortly afterwards. The animal appeared to posses the crafty idea that its colour formed a valuable deception, and was not slow to make use of its advantage. At any rate, it used to mix freely with the grazing herds of the district without apparently causing any alarm and was thus able to make a "kill" whenever it felt like it.

As a matter of fact, it was known to have carried off as many as five cattle in one night.

The death of the brute, which measured nine feet eight inches from nose to tail, was an event of great joy to the inhabitants of the of the district.—Extracted from "The Statesman".

* * * * *

Eucalyptus oil as a Motor Fuel.

The Australian commonwealth Government is interesting itself in certain experiments which have been made with the intent of using eucalyptus oil as a motor fuel. The experiments were performed by Captain C. M. Dyer, who claims to have established that eucalyptus oil can be used in gasoline engines, with efficient means of vaporization. The only difficulty is that it will not start an engine from cold without priming. On the other hand, the Calorific value is high. Tests made with cheap cars are reported to have shown that a run on gasoline gave twenty four miles to the gallon. When the cars were run on a mixture containing half gasoline and half eucalyptus oil, twenty eight miles were obtained per gallon, while when run on eucalyptus oil alone, as much as thirty six miles per gallon of the fuel were obtained. He states that eucalyptus oil will mix well with gasoline, benzol and alcohol and that it acts as a decarbonising agent, maintaing the cylinders and pistons free from carbon. There are seventy different varieties of the eucalyptus tree in Australia. The oil yields range from 0.02 to 35 pounds per thousand pounds of the leaf treated. Distillation is a simple process, requiring no skilled labour. The main difficulty of manufacture on a large scale would be labour for gathering the leaves.—(*The chemical age of London*).

Extracted from "The Scientfic American" for February 1924.

[The Forest Utilization Officer, Mr. Harloe Irwin, states that he also has tested this, and confirms the results—Ed.]

Motor-Driven "Big wheels."

On the pine-clad plateaus of Southern Oregon and Northern California, where ground conditions are favourable, logging operators for many years have been using a unique method of yarding logs to the railway spurs, known locally as the "Big wheel system." Briefly, the method consists of suspending or balancing the load of one or more logs from the axle of a pair of giant wooden or steel wheels eight to ten feet in diameter. The tongue, to which is ordinarily attached two or four horses, is adjustable in length, and extends several feet behind the axle. The "slip tongue" provides the required leverage for raising the logs clear of the ground, and at the same time can be adjusted to keep the load in balance.

The steadily increasing cost of horse feed coupled with the short radius of economical yarding with animals, has led one operator to experiment with motor propelled "big wheels." The application of the gasoline motor required the addition of two wheels in front to provide the suspension point formerly supplied by the animals and to offer a means of steering the machine.

The machine, which has not yet been named, consists of two big wheels 10 feet in diameter with 20 inch tread, together with two power operated steering wheels six feet in diameter. The frame is built of I beam structural steel with heavy steel castings. The big wheels are spaced 9 feet 8 inches from centre to centre, and the inverted "U" axle has a ground clearance of 6 feet, the same clearance being secured between the steering wheels through the use of an automobile steering device. The machine can straddle a five foot log, and lift it nearly a foot from the ground.

A 90-horse power motor, mounted on the upper part of the frame, where the gears, transmission and steering devices are also located furnishes the power of both driving the machine and lifting the log. This power is transmitted to the big wheels through a specially designed transmission and gear and gives the following speeds with the engine turning 800 r. p. m. low, 1.78 miles per hour; intermediate, 2.69 miles per hour; high, 5 miles per hour.

The power is transmitted to the big wheels by an internal spur gear. A jack-shaft receives the power through the gears from the engine, and in turn transmits it to the big wheels through two gears meshing with two internal bull gears seven feet in diameter, riveted to the rim and to the steel spokes.

The log-lifting device is capable of lifting 20 tons with ease, and is so arranged that the entire power of the engine may be applied to it or released instantly in order that the log may be dropped when the machine is going down hill and serve as a brake. The log hoist is also equipped with brakes, as is the machine itself. The power of the engine is applied to the hoist shaft through gears, and two chains carried on drums on the ends of the shaft are attached to the choker and passed around the log.

The load is then swung clear of the ground, if desired, or the rear ends of the logs are allowed to drag. The hoisting device locks until it is desired to lower or drop the load. The power is then transmitted to the big wheels and the machine moves forward.

—*Extracted from The Scientific American" for Feb. 1924.*

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Vegetable Butters.

Butter Tree. This is a remarkable plant found by Mungo Park in the interior of Africa, especially in Bombarra. On applying pressure, it yelds from its kernels, a white, firm, rich butter, which even in that climate, will keep well for a year without salt. What i known as "Indian Butter Tree" is the Bassia Buttyracea (Phulwara.) Its seeds produce a firm agreeable buttery substance of about the consistence and colour of buffalo ghee. It is used medicinally in pneumatic affections.

The Illipai tree of Coromandal (Bassia Longifolia) and the Mahwa tree of Bengal (Bassia Latifolia are other species possessing similiar properties.

The oil from Bassia Buttyracea is generally, however, upheld as a more valuable than that of the other species, chiefly because it solidifies almost immediately after being expressed from seeds

Garcinia Indica is another tree of importance, which should be mentioned in this connection. It goes by several names: Konkan Butter, Mangosteen oil or Brindonia Tallow Tree. It is found in the forest of Canara, Coorg etc. and is planted in the South of the Bombay Presidency. It thrives particularly well in the lower slopes of the Nilgiris. The fruit is sometimes called the wild mangosteen and has long been considered an article of food. From the seeds of the fruit a vuluable oil is extracted known as Kokam butter. It is obtained in one of several ways by boiling, churning, or simply by pressing the seeds in an ordinary oil mill.

It is found in the bazaars in the form of egg shaped or oblong lumps of whitish colour, at ordinary temperatures, firm, dry and friable yet greasy to the touch. It is also used as a substitute for Cod liver oil and in the preparation of ointments.

The seeds of the Cacao (Theobroma Cacao), when warmed and subjected to pressure yield a light yellowish opaque solid oil, known as "Cacao Butter." This has the pleasent odour of chocolate, melts in the mouth with an agreeable taste.

Bassia Latifolia gives a greenish yellow oil eaten by the Gonds and other central Indian tribes and it is extracted from the kernel of the fruits. It is used to adulterate ghee This is sometimes called Doli oil especially in Western India and the same name is applied to the seeds. It is called Madhuka Sara in Hindi and is recommended, as a medicine. It is often sold in the form of cakes, which keep fresh for a few months in cold climates, but in the plains, they soon become rancid, separating into a clear oil and a brown fatty substance The cakes are sold as Illipi Butter.

To extract the oil, the Kernels are taken out from the smooth chest-nut coloured pericarp, by being bruised, rubbed and subjected to a moderate pressure. They are then ground and the oil obtained by pressure. In the central provinces, the Kernels are pounded and boiled and then wrapped up in two or three folds of cloth and the oil taken out. In the Western tracts of Bengal and in the Central Provinces, besides being used for lighting, this oil forms a very inexpensive substitute for ghee. The seeds yield a thick concrete oil, which is recommended to be applied to the head in cephalagia.

The seeds of Bassia Longifolia also contain oil which is yellow and semi solid, used for adulterating ghee.

—Extracted from "The Industry" Vol. XIII 1922.

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Extracts from the College Museum Visitors' Book.

"The vegetables are very curious to look and cleared my melancholy of my brother's death when I noticed closely every article in the Museum." Merchant.

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"There are good collection of butterflies and beatles. It is worth seeing. Our ancestors is more civilised than the old English. I myself is quite satisfied with the sections of wood, collection eggs catching elephants, boats, etc. I think the Museum much improved in course of years I suppose." Student.

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"I had a terrible shock on my head from the door of the third storey Kindly do the needful."

"I had the good luck to know the different kinds of trees and their curiosities from this blessed place."— Student.

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"Very delightful to my eyes. When I saw all these manual labours my joy was inexpressible and knew no bounds." Student.

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"Sir, I am very glad to see these things but prefer more tempting things hereafter."

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"It will be more attractive if there were live animals."

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"Ancient beauties are not up to the mark." Tamil Pundit.

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"All are very $\left\{\begin{array}{l}\text{beautiful}\\ \text{beatufal}\\ \text{batiful}\end{array}\right\}$ to look at."

"I was surprised to see the artificial gate keeper."

"Statues of great men are needful." College office Clerk.

"Well kept. Live birds and snakes desirable.—Student.

"When I find my mind troubled with gloomy thoughts I shal at once recollect this Museum."

"I have persued the famous and important articles and all other things, tiger and other wild beast skins etc., astonished myself and have quite satisfied. I have travelled throughout India but I could find in any other Museum except this College Museum. But all things and articles are in good order and found exceedingly well. The Honourable Principal of this College is a very good gentleman and took much care about this Museum. How I pray God this Museum will improve in all other respects. This good remarks I myself informed to the public and to the other visitors." Vakil.

"I am struck with fear as soon as I saw the specimen of a soldier standing at the gate." Student.

" Beautiful and most bright. Landlord.

"I am sure that this kind Museum help the public very much in improve their residence and source of income." Merchant.

"If any dull man comes here and sees, then at once his dull brain will change into a good brain, and also learn a lot of things..." Student.

Contributions to the Gass Forest Museum

Serial No.	Contribution	Contributor.
1.	One mounted horn bill	M. R. Ry. K. A Bhandary.
2.	Ninetyfive botanical specimens	C. E. C. Fischer Esq. I. F. S.
3.	Seveventy five timber panels	T. Clear Esq. I. F. S.
4.	Model of a *Khond* village	
5.	„ „ *Savara* hut.	

Additions to the Madras Forest College Library.

1. *Presented by Mrs. F. M. Salisbury:*

"Indian Forest Utilization,"—By, R. S. Troup, F.C.H., I.F.S.

"A Manual of Forestry"—;By, W. Schlich Vol., III, Forest Management.

"The Practical Determination of the girth Increment of Trees with tables."—By R. S. Troup.

"A Concise Manual of Sylviculture"—1910.

"Forest Working Plans in India."—By, W. E. D'Arcy.

"A Manual of Forest Mensuration."—By, R S. Troup.

"Useful Rules and Tables Relating to Measurement of Timber."—By, Rai Bahadur Kunya Lall, M. Inst. C. E,

"A Manual of Forest Law." 1906.

"Surveying."—By, Lt.-Col. F. Firebrace, R. E. 1907.

"A manual of chain survey for Karnams and Revenue subordinates."

'P. W. D. Standard specifications in the Madras Presidency. A supplement to Drury's useful plants of India."

Glossary of the botanical terms used in describing flowering plants—By R. L. Heinig.

2. Descriptive list of the Forest flora of East Central Madras with key.—By C. E. C. Fischer Esq. I. F. S.

3. Mahabaleswar working Plan report.

4. Progress report of the Imperial Forest College, Dehra Dun for the year 1922—1923.

5 Revised Working Plan for the forests of Upper Sindh Circle 1923.

6. The Indian Forest Records Vol. X Part (iii)

Sal (Shorea robusta) yield table for the United Provinces. By E. A. Smythies B.A., and S. H. Howard B A., 1923.

7. The constituents of some Indian Essentail oils—Part XII By J. L. Simonsen, 1923.

8. Madras Forest Bulletin No. VI. Sylvicultural research in the Madras Presidency. 1922-23. By, J. M. Sweet Esq I. F. S.

9. Bulletin of the yale University School of Forestry 1923-24

10. Administration report of His Exalted Highness the Nizam's Dominions for 1331 Fasli.

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Publications Received by the Editor during the quarter ending March 1924.

We have pleasure in acknowledging receipt of the following publications received during the quarter ending March 1924.

1. "The Madras Agricultural Students' Union Journal" January 1924.

2. The Junglewallah"

3. "Proceedings of the Madras Forest Rangers' Association,' at the third annual conference held at Madras, between 28th and 30th December 1922, under the Presidency of Rao Bahadur M. C. Rajah, M L. C.

4. "International Review of the Science and Practice of Agriculture."—Oct.—Dec.—1923.

5. "The People's Friend."

Gazette Notifications.

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13—11—23.

M. R. Ry. A. V Sundaram Avergal, D. F. O. West Vellore, is appointed also as Deputy Collector in the North Arcot Dt.

Mr. A. N. Ananthanarayana Sarma appointed by the Secretary of State to the Indian Forest Service, reported his arrival at Bombay on the afternoon of the 26th October 1923.

20—11—23.

Mr. T. Clear, Dy. Consr. of Forests, and Forest Utilization officer, to be D. F. O. North Coimbatore.

Mr. J. W. K. Wernham, D. F. O. Palghat, to be Forest Utilization officer, Madras.

Mr. S. K. Basu appointed by the Secretary of State to the Indian Forest Service reported his arrival at Bombay on 9—11—23.

The following officers appointed by the Secretary of State to the Indian Forest Service reported their arrival at Bombay on 9—11—23:—

Mr. M. K. Nayar; Mr. N. D. Sahni; Mr. H. C. Khanna.

M. R. Ry. A. Raju Nayakar, D. F. O. Central Salem is granted leave on average pay for twenty days from 4—11—23.

Mr. A. N. Ananthanarayana Sarma, Imperial Forest Service probationer, is posted to Ganjam for training under the D. F. O.

4—12—23.

M. R. Ry. A. V. Sundaram Avergal E. A. C. of Forests, and acting D. F. O. West Vellore, on relief by Mr. D. L. Sathe, is posted to South Vellore Dn. as an attached officer.

Mr, D. L. Sathe, Dy. Consr. of Forests, is granted a further extension of leave on average pay for three days in continuation of the leave already granted.

M. R. Ry. A. V. Sundaram Ayyar, Avl., E. A. C. of Forests and D. F. O., W. Vellore, will continue to be in charge of the division during the absence of Mr. D. L. Sathe on leave.

11—12—23

Mr. N. D. Sahni is transferred from the Palghat Dn. to the Forest Exploitation division.

Mr. C. R. Ranganatham, Imperial Forest Service probationer, is posted to N. Coimbatore for training.

In modification of the orders already issued, Mr. A. N. Ananthanarayana Sarma, Imperial Forest Service probationer, is temporarily posted to the Chingleput Dt. for training under the D. F. O.

"It is hereby notified for the information of the public that the office of the Forest Engineer, whose head-quarters were at Salem hitherto, has been transferred to Coimbatore. All correspondence intended for the Forest Engineer, Salem, must be addressed to the Coimbatore address after the 15th December 1923.

18—12—23.

Mr. W. C. Hart, E. A. C. of Forests, an extension of leave on average pay on medical certificate for three months in continuation of the leave already granted to him.

Mr. C. R. Ranganathan appointed by the Secretary of State to the Indian Forest Service reported his arrival at Bombay, on the forenoon of the 30th November 1923.

Mr. S. K. Basu, and Mr. M. K. Nayar, Asst. Conservators of Forests are granted leave not due on half average pay from 12—11—23 to 10—12—23, and from 12—11—23 to 5—12—23 respectively.

1—1—24.

M. R. Ry. K. G. Belliappa Avl. E. A. C. of Forests granted leave on averago pay for two months from 3—1—24 with permission to prefix the Christmas holidays.

M. R. Ry. S. V. Devadasan avl. E. A. C. of Forests, and District Forest officer, Chingleput, granted leave on averagge pay for six weeks from 3—1—24.

M. R. Ry. A. Hanumantha Rao avl. E. A. C. of Forests, Tinnevelly is posted to be in charge of the Chingleput Dt. during the absence of M. R. Ry. S. V. Devadasan on leave.

8—1—24.

His Excellency the Grand master, of the Most Eminent order of the British Empire is pleased to announce that His Imperial Majesty, The King Emperor of India has been graciously pleased to make the following promotion in, and appointment to, the said Order:-

To be Knight Commander.

The Hon'ble Mr. Arthur Rowland Knapp, C. S. I., C. B. E., I. C. S. Member of the Madras Executive Council.

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His Excellency the Viceroy and Governor General is pleased to confer the title of *Rao Sahib,* as a personal distinction, upon:-

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M. R. Ry., Tirumalai Ayyangar Ramanuja Ayyangar avergal Manager, office of the Chief Conservator of Forests, Madras.

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15—1—24.

S. Doraisami Ayyar, Manager, Forest College, Coimbatore, is dismissed from the Service of Government, and is debarred from re-employment in it.

Mr. A. N. Anantanarayana Sarma, Asst. Conservater of Forests, Chingleput Dt., is posted to Ganjam for training under the District forest Officer.

22—1—24.

Mr. D. F. Stileman, Dy. Conservator of Forests, will, on the expiry of the examination leave, be attached to the North Coimbatore Division until he avails himself of the leave sanctioned in G. O. No. 499 dated 2—11—23.

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Notifications relating to Range Officers.

First Circle.

12—11—1923.

1. M. R. Ry. B. Bhagirathi, Ranger VII Grade, Ganjam District and N. S. Ayyanna, Supernumerary Ranger, Upper Godaveri, are appointed as Senior and Junior Instructors respectively of the 1924 Session of Vernacular Training School, commencing at Russelkonda on Monday the 7th January 1924.

2. (i). M. R. Ry. K. Venkatesam Naidu, Supernumerary Ranger, Upper Godaveri, to charge of the Cherla Range.

(ii). M. R. Ry. B. V. Nagarajan, Ranger III Grade, from Cherla Range, to the Pulusumamidi Range, Upper Godaveri.

(iii). M. R. Ry. M. Subbarao, Ranger VI Grade, from Pulusumamidi Range to the Surada Range, Ganjam District to relieve Ranger B. Bhagirathi appointed as Senior Instructor of the Vernacular Training School.

22—12—23.

3. 1. M. R. Ry. P. Duraswami Iyer, Ranger III Grade is granted leave on full average salary for 1½ months with effect from 3rd January 1924.

2. M. R. Ry. A. Tirupatirayudu, Supernumerary Ranger will hold charge of the Polavaram Range during the absence of No. 1 on leave.

3—1—24.

4. 1. M.R.Ry. K. V. Subba Rao, Ranger II Grade is granted leave on average salary for 6 months from date of relief preparatory to retirement.

2. M. R. Ry. K. Balakrishna Rao, Ranger IV grade, is posted to charge of the Peddapur Range.

5. 1. Ranger C. S. King is to hold charge of Ellore Range in addition to Bezwada Range.

2. M. M. Ry. A. Mannikka Mudaliar, Ranger V grade, Ellore Range is on relief, transferred to Ganjam to charge of the Bontha Range.

30—1—24.

6. M. R. Ry. A. Manikka Mudaliar, Ranger V grade is granted privilege leave for 10 days with effect from date of relief from Ellore Range, Kistna District. His transfer to charge of Bontha Range, Ganjam District ordered in this office S. O. No. 2 of 24 dated 3—1—24 will take effect on his return from the above leave.

Second Circle.

15—11—23.

7. Supernumerary Ranger J. B. Rodrigues is granted an extention of leave for 2½ months on average pay on medical Certificate in continuation of the leave already granted to him in this Office S. O. No. 80/23 dated 8—9—23.

23—11—23.

8. 1. M. R. Ry. S. Chinnadurai Pillai, Ranger II Grade, is posted to Kurnool South to report himself for duty before the District Forest Officer on the expiry of his leave.

2. M. R. Ry. O. Venkatarama Iyer, Ranger I Grade, is posted to Kurnool West-to report himself for duty before the District Forest Officer on the expiry of his leave.

8—12—23.

9. M. R. Ry. M. Subbarayalu Naidu, Ranger III Grade on leave is posted to Kurnool South Division and should report himself for duty before the District Forest Officer on the expiry of his leave.

11—12—23.

10. M. R. Ry. S. Chinnadurai Pillai, Ranger II Grade is granted an extension of leave on half average pay on Medical Certificate from 2-12-23 for 3 months.

21—12—23.

11. Ranger B. Punnayya is permitted to rejoin duty on 16-11-1923 before the expiry of the one month's leave from 6-11-1923 granted in this Office S. O. No. 110/23 dated 9-11-1923.

The unexpired portion of the leave *i. e.*, 20 days from 16-11-1923 is cancelled.

9—1—24.

12. The following postings and transfers of Rangers are ordered:-

(1) Supernumerary Ranger J. B. Rodrigues on return from leave (13—1—24) is posted to the charge of Vinukonda Range, Guntur District.

(2) Ranger N. C. Mahadevan Pillai (in charge of Vinukonda Range) on relief by No. 1 is transferred to Harpanahalli Range, Bellary District. This cancels his posting to Kurnool South ordered in S. O. No. 102/23 dated 20—10—23.

(3) Supernumerary Ranger T. M. Krishnamachari in charge of Harpanahalli Range on relief by No. 2 to be on Special Duty in the same District.

20—1—24.

13. The following posting of Rangers are ordered:—

1. M. R. Ry. O. Venkataramana Aiyer, Ranger I Grade on special duty Kurnool West Division is posted to the charge of Gundlabrahmeswaram Range.

2. M R. Ry. G. N. Subba Rao, Ranger VI Grade, in charge of Gundlabrahmeswaram Range on relief by No. 1 to be on special duty in the same Division.

22—1—24.

14. M. R. Ry. B. Krishna Rao, Ranger III Grade will report himself at once to District Forest Officer, Kurnool East Division.

Third Circle.

11—11—23.

15. Mr. T. T. Ansep Ranger III Grade is granted leave on average pay from 17—10—1923 to 30—10—1923 (inclusive).

23—11—23.

16. M. R. Ry. P. Chengal Reddi, Ranger VI Grade in charge of Chitvel Range South Cuddapah District is granted leave on average pay for 3 months from date of relief by M. R. Ry. S. Sankaran Ranger V Grade on relief of Balapalle Range charge of the same District by M. R. Ry. S. Chidambara Ayyar transferred from the V Circle.

26—11—23.

17. Ranger V. P. Narayana Menon on special duty Chittoor District is posted to the charge of Chittoor Range Chittoor District in relief of Ranger S. Ramachandra Ayyar to join Vernacular Training School.

18. M. R. Ry. S. Ramachandra Ayyar, Ranger III grade in charge of Chittoor Range - Chittoor District is appointed to be the Senior Instructor, Vernacular Training School 1924 Session to be held in North Cuddapah District.

2. M. R. Ry. D. Krishnaswamiah, Sub Pro tem Ranger VI grade on special duty in Chittoor District is appointed to be the Junior Instructor Vernacular Training School 1924 Session.

29—11—23.

19. M. R. Ry. B. Chenchu Ram Naidu Ranger IV grade-Sanipaya Range West Cuddapah District is granted leave on average pay for 2 months with effect from date of relief.

2. M. R. Ry. N. Rajagopaul Chetty Supernumerary Ranger on special duty in North Cuddapah District is posted to the charge of Sanipaya Range of West Cuddapah District to join expeditiously and relieve No. 1.

22—12—23.

20. Mr. E. W. Fernandez Ranger V grade on special duty Nellore District is granted leave on average pay for 3 months on Medical Certificate with effect from 30th October 1923 - the date of absence from duty.

21. The three months' leave on average pay granted to Ranger P. Chengal Reddi and the posting of Ranger S. Sankaran to Chitvel Range ordered in this office Service Order No. 89/23 dated 23rd November 1923 is cancelled.

8—1—24.

22. M. R. Ry. G. Devanayagam Naidu Ranger V grade, Rajampet Range is granted leave on average pay for 2½ months with effect from date of relief.

2. M. R. Ry. T. Venkatasubbaiah Supernnmerary Ranger, Nellore District is posted to the charge of Rajampet Range of South Cuddapah District - vice No. 1 on leave.

12—1—24.

23. Probationary Ranger T. Venkatasubbiah, is granted leave on average salary for 10 days from the date of availing with permission to prefix the Christmas holidays.

17—1—24.

24. Ranger S. Chidambara Ayyar transferred from V Circle is granted leave on average pay for 2 months and 6 days with effect from 10th December 1923.

25. Mr E. W. Fernandez on return from leave granted in this office Service Order No. 94/23 dated 22nd December 1923 is posted to Nellore District on special duty to work under the orders of the District Forest Officer.

2—3—24.

26. 1. M. R. Ry. B. ChenchuRam Naidu, Ranger IV grade is granted extension of leave for 6 weeks - consisting of leave on average pay for 25days, and the balance of 17 days as leave on average pay on medical certificate from 13th February 1924; the date on which the leave granted to him in this office S. O. No. 92/23 dated 29th November 1923 expires.

2. M. R. Ry. N. Rajagopaul Chetty, Supernumerary Ranger, will continue to hold charge of the Sanipaya Range vice No. 1 on leave.

Fourth Circle.

16—11—23.

27. 1. M. R. Ry. S. G. Venkatramana Ayyar Ranger V grade in charge of Shevaroys West Range Central Salem Division is granted leave on average salary from the date of relief to 15th January 1924 subject to the eligibility to the leave.

2. M. R. Ry. I. Z. Robert Paul Supernumerary Ranger on special duty Central Salem is posted to the charge of Shevaroys West Range during the absence of No. 1 on leave or until further order.

20—11—23.

28. This Office Service order No. 95/23 dated 10—11—23 posting Ranger M. Muthusami Ayyar to South Vellore District is cancelled and he is now posted to Shevaroys West Range Central Salem District on return from leave.

21—11—23.

29. M. R. Ry. V. D. Ramalingam Pillai, Ranger VI grade, South Salem Division, is granted extension of leave on *half* average pay for two months in continuation of the leave granted to him

in this office Service Order No. 74 of 1923, dated 31—7—1923 subject to the production of certificate of eligibility to the leave now granted.

7—12—23.

30. M. R. Ry. C. Rajagopal Nayudu, Ranger I grade, East Salem Division, is granted leave on half average pay from 5—12—1923 to 11—12—1923 both days inclusive in extension of leave granted in this office Service Order No. 80 of 1923, dated 1—9—1925.

8—12—23.

31. In cancellation of this office Service Order No. 100 of 1923, dated 20—11—1923, M. R. Ry. K. P. Krishna Ayyar, Ranger I grade is on return from leave, posted to the charge of Shevaroys West Range, Central Salem Division.

14—12 –23.

32. *For* the word *"return"* occurring in the foot note to this office, Service Order No. 105 of 1923, dated 7—12—1923, communicated with this office D. Dis. 1914-23-A., dated 7—12—1923, please *read "retire."*

15—12—23.

33. In modification of this office Service Order No. 150, dated 30—9—21 and 107, dated 13—8—1922, M. R. Ry. M. Pakyanathan, Ranger II grade, East Salem Division, is granted combined leave from 11—12—1921 to 24—10—1922, i. e., leave on average salary for 8 months and leave on half average salary for the remaining period.

19—12—23.

34. M. R. Ry. M. Muthuswami Ayyar, Ranger II grade, Central Salem District is granted extension of leave on medical certifi-

cate on average salary for 1½ months in continuation of the leave granted to him in this office Service Order No. 75 of 1923, dated 3—8—1923.

21—12—23.

35. In cancellation of this office Service Order No. 105 of 1923. dated 7—12—1923, M. R. Ry., C. Rajagopal Nayudu, Ranger I grade, East Salem Division, is granted leave on *average salary* on medical certificate from 5—12—1923 to 11—12—1923 both days inclusive in continuation of the leave granted to him in this office Service Order No. 80 of 1923, dated 1—9—1923.

22—12—23.

36. 1. M. R. Ry., R. Subramania Ayyar, Ranger III grade on leave, is, on production of medical certificate of fitness to return to duty, posted to the charge of Vaiyampatti Range, South Salem Division.

2. Syed Munavar Sahib, Ranger V grade, on relief by No. 1 is posted to supervise extraction of spiked Sandal in South Salem and such other duties as the District Forest Officer may give him without prejudice to that work. His Head Quarters will be Turaiyur.

24—12—23.

37. In partial modification of this office S. O. No. 277 of 1923, dated 25—10—1923, M. R. Ry., P. A. Krishnaswami Mudali, Ranger V grade Polur Range, is granted leave on average pay on medical certificate for one month from 1—11—1923.

25—12—23.

38. (1) M. R. Ry., M. Pakyanathan, B. A., Ranger II grade, Atur Range, is granted leave on average pay with effect from 3—1—1924 (with permission to prefix Christmas holidays) to 15—1—1924.

(2) T. Perumal Goundar, Supernumerary Ranger, Kallakurichi Range, to hold charge of the Attur Range Vice No. 1 on leave or until further orders.

2—1—24.

39. (1) M. R. Ry., S. G. Venkataramanan, Ranger V grade on return from leave, is posted to the charge of Kallakurichi Range, East Salem Division if V. T. S. is not held.

(2) M. R. Ry., K. R. Subramaniam, Ranger VII grade, on relief by No. 1, is posted to Kadiyampatti Range, Central Salem Division on special duty to assist the Range officer to get his office work in order including his offence reports.

7—1—24.

40. Ranger M. Muthuswami Ayyar, II grade, Central Salem Division, after production of medical certificate of fitness to return to duty, from leave, is posted to Central Salem Division, for special duty.

10—1—24.

41. M. R. Ry., S. G. Venkataramana Ayyar, Ranger V grade, is granted extension of leave on average salary for 2 months and 10 days in continuation of the leave granted to him in this office Service Order No. 98 of 1923, dated 16—11—1923.

14—1—24.

42. 1. Ranger P. Sithapathi Ayyar, V grade, in charge of Chitteri Range, East Salem Division, is appointed as Instructor, Vernacular Training School to be held in North Salem Division during the Session 1924.

He should hand over to the Range officer, Harur, as soon as possible.

2. Ranger Syed Munavar, V grade, on special duty, South Salem Division, is posted to the charge of Chitteri Range, East Salem Division—Vice No. 1—to take over from the Range officer, Harur, expeditiously.

3. Supernumerary Ranger T. Perumal Gounden, East Salem Division, is appointed as Assistant Instructor, Vernacular

Training School to be held in North Salem Division during the Session 1924.

16—1—24.

43. M. R. Ry. R. Thangavelu Pillai, Ranger VII grade, will be considered to have joined duty at Trichinopoly on the forenoon of 21st November 1923 and to have been on special duty from that date of taking over charge of Musiri Range, i.e., 26-11-23 afternoon.

22—1—24.

44. M. R. Ry. J. S. Vedanayagam, Supernumerary Ranger, Tirupatur Range is granted leave on average pay for 20 days from 5—1—1924 to 24—1—1924 (both days inclusive).

23—1—24.

45. Ranger M. Pakyanathan, II Grade, in charge of Attur Range, East Salem Division, is appointed as Instructor, Vernacular Training School, to be held in North Salem Division during the session 1924.

(2) Ranger Syed Munavar, V grade, in transit, is posted to the charge of Atur Range. He should relieve No. 1 forthwith.

28—1—24.

46 The period of absence of Saiyid Ibrahim Albeiz Shaib, Ranger III grade, from 3—1—1924 to 8—1—1924 will be treated as leave on average pay. He is permitted to prefix holidays from 22—12—1923 to 2—1—1924.

29—1—24.

47. M. R. Ry., V. D. Ramalingam Pillai, Ranger VI grade, South Salem, is granted further extension of leave on *half* average pay for 3 months in continuation of the leave granted in this office Service Order No. 102 of 1923, dated 21—11—1923.

7—2—24.

48. The unexpired portion of 5 days leave on average pay (from 20—1—1924 to 24—1—1924 granted to Supernumerary Ranger Mr. J. S. Vedanayakam in this Office S. O. No. 12 of 1924, dated 12—1—1924 is hereby cancelled as the Ranger is reported to have rejoined duty on 20—1—1924 (forenoon).

3—2—24.

49. M. R. Ry., M. Muthuswami Ayyar, Ranger II grade, Central Salem Division, is granted further extension of leave on average salary on medical certificate for 3 months in continuation of the leave granted to him in this office Service Order No. 108/23., dated 19—12—1923.

Fifth Circle.

13—11—23.

50. M. R. Ry., S. Chidambara Ayyar Ranger IV grade, Talamalai Range, North Coimbatore District, is, on relief by M. R. Ry., K. Karunakaran Nambiar Ranger III grade,—about 1st December transferred to Cuddapah District.

23—11—23.

51. M. R. Ry., M. Gulab Singh, Ranger VI grade South Coimbatore is granted an extension of leave on half average pay for 3 months from 2nd December 1923 in continuation of the 2 months leave on average pay and 3 months leave on half average pay; granted to him in this office S. O. Nos. 44 of 23 dated 11th June and S. O. No. 86 of 23, dated 25th October 23 respectively.

28—11—23.

52. 1. M. R. Ry., S. Venkataswami Naidu Ranger V grade, Tinnevelly District is granted leave on average pay for 4 months from date of relief.

2. M. R. Ry., C. R. Ragunathan Ranger VI grade on expiry of his leave is posted to charge of Tinnevelly Range in relief of No. 1.

24—12—23.

53. M. R. Ry., M. Sankaran Nayar Ranger VI grade, Ambasamudram is granted leave on average pay on medical certificate for 2 months from 15th December 1923.

24—12—23.

54. The leave for 20 days granted from 29th Octoter last Ranger P. Ramaswamy Ayyar by the District Forest Officer Tinnevelly is extended by leave on half average salary for 18 days and by leave on average salary for 2 months from 5th December 23 on medical certificate.

4—1—24.

55. (1) Mr. A. R. Manual, Supernumerary Ranger, South Coimbatore District, is transferred to Madura District to charge of Kodaikanal Range.

(2) Mr. M. P. Philip, Supernumerary Ranger in charge of Kodaikanal Range, is transferred from Madura to South Coimbatore District on relief by No. 1.

5—1—24.

56. The absence from duty of Mr. C. H. Ashe Ranger III grade from 18th November 1923 to 10th December 1925, is treated as leave on average pay.

18—1—24.

57. The order posting Supernumerary Ranger M. P. Philip to South Coimbatore in this office S. O. No. 1 of 24, dated 4th January 1924, is cancelled and Ranger Tiruvengadam Pillai is transferred from Madura to South Coimbatore instead. He should proceed there at once.

30—1—24.

58. The absence from duty of M. R. Ry. S. Shanmughakumaran Pillai Ranger II, Sholavandan Range from 9th November 1923 to 9th December 1923 is treated as leave on full pay (Privilege leave for 19 days and commuted furlough on medical certificate for the remaining period).

Sixth Circle

59. (1) Mr. J. S. Rowland, Ranger III grade, on return from leave (1-2-1924) to the charge of the Coondapoor Range, North Mangalore Division.

(2) Mr A. Nicholas, Ranger III grade, from Coondapoor to the charge of the Mudumalai Range in the Nilgiri Division.

(3) M. R. Ry. A K. Kandan, Ranger, III grade sub-protem, from Mudumalai Range to the charge of the Coonoor Range, The Nilgiris.

(4) M. R. Ry. P Kannan, Ranger VII grade, attached to the Coonoor Range, to be on special duty in the Nilgiris for work in the Kundahs, Ootacamund Range.

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